SICK

AS-i 2.1

DP V0 and DP V1

# AS-i/PROFIBUS-Gateways

# ASI-M31320

# ASI-M32320

# ASI-M31330

# User Manual

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# EC Declaration of Conformity

**In Compliance with the EC Directive on Electromagnetic Compatibility 89/336/EWG**

We hereby declare that the devices (see page 2)

**of the product family ASI-M.....**

comply with the basic requirements of the EC Directive specified under Point 1. If an item of equipment listed overleaf is modified without our approval then this declaration loses its validity for this equipment.

We employ a quality system certified by the DQS (German Quality Assurance Society), No. 462, as per ISO 9001 and have therefore observed the regulations in accordance with module H as well as the following EC directives and EN standards during development and production:

| | | | |
|---|---|---|---|
| 1. ***EC directives*** | EC EMC Directive 89/336/EEC as per 92/31/EEC, 93/68/EEC, 93/465/EEC | | |
| 2. ***Harmonized standards used*** | EN 50081-2 | Emitted interference, industry | Ed. 93-08 |
| | EN 50295 | Low-voltage switchgear and controlgear - Controller and device interface systems - Actuator Sensor interface (AS-i) | Ed. 99-03 |
| | EN 61000-6-2 | Electromagnetic compatibility Part 6-2: Immunity, industry | Ed. 99-04 |

Conformance of a type sample belonging to the above-mentioned product family with the regulations from the listed EC directives has been certified by:

Waldkirch/Br., den 30/08/01

ppa. Reglowicki
(Manager Marketing & Sales
Division Industrial Sensors)

i.V. Hertweck
(Manager Production
Division Industrial Sensors)

The declaration certifies conformance with the listed directives, but does not guarantee product characteristics. The safety instructions contained in the product documentation must be observed.

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# 1 The Used Symbols

Warning

*This symbol warns the user of possible danger. Failure to heed this warning can lead to personal injury or death and/or damage to equipment.*

Attention

*This symbol warns the user of a possible failure. Failure to heed this warning can lead to total failure of the equipment or any other connected equipment.*

Note

*This symbol gives the user important hints.*

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# 2 Safety

## 2.1 Intended Use

Warning

*The protection of operating personnel and the system against possible danger is not guaranteed if the control interface unit is not operated in accordance with its intended use.*
*The device may only be operated by appropriately qualified personnel in accordance with this operating manual.*

## 2.2 General Safety Information

Warning

*Safety and correct functioning of the device cannot be guaranteed if any operation other than that described in this operation manual is performed.*
*The connecting of the equipment and any maintenance work to be carried out with voltage applied to the equipment must only be performed by appropriately qualified electrotechnical personnel.*
*In the case that a failure cannot be repaired, the device must be taken out of operation and kept from inadvertently put back into operation. Repair work is to be carried out by the manufacturer only. Additions or modifications to the equipment are not allowed and void the warranty.*

Note

*The operator is responsible for the observance of local safety standards.*

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# 3 General Information

This operating instruction is for use with the following devices of the SICK AG:

- ASI-M31320 Order no. 6 022 376
- ASI-M31330 Order no. 6 022 378
- ASI-M32320 Order no. 6 022 377

The AS-i/PROFIBUS-Gateways serve to connect AS-Interface systems to the PROFIBUS. They act as a Master for the AS-Interface and as a slave for the PROFIBUS.

**New AS-i Specification 2.1**

The AS-i/PROFIBUS-DP Gateways already fulfil the new AS-i Specification 2.1. This means:

- Up to 62 AS-Interface slaves can be connected per 1 AS-i network
- The transfer of analog signals via AS-i is integrated in the Masters
- All further functions of the new specification as e.g. the diagnosis of the AS-i peripheral fault are implemented.

All AS-i functions are provided cyclically via PROFIBUS-DP V0 and acyclically via PROFIBUS-DP V1.

In the cyclic data transfer optionally up to 32 bytes I/O data are transfered for the binary data of 1 AS-i network. Furthermore analog signals and all further commands of the new AS-i specification can be transferred in the management channel via PROFIBUS.

The AS-i Control Tools can be used for the monitoring of the AS-i data online via the PROFIBUS-DP V1.

**Advanced Diagnostics**

Diagnostics, which go far beyond the standard diagnostics facilitate the simple detection of the occassionally occuring configuration errors and further irritations towards the AS-i communication. So in case of an error the down time of machines can be minimized or you can initiate preventive maintenance.

**Two Sorts of Housing**

The AS-i PROFIBUS Gateways with one Master can be delivered in a housing for cabinet mounting or in a field housing in IP65. The handling of the AS-i/PROFIBUS Gateway in IP65 is identically with the AS-i/PROFIBUS-DP Gateway in IP20. The high protection category IP65 makes the device suitable for applications in the extreme industrial environments frequently encountered in the field. AS-Interface is connected using the penetration technique of EMS (Electromechanical Interface). PROFIBUS is connected with heavy gauge terminals and cage clamp terminal blocks.

**Commissioning and monitoring**

The AS-i/PROFIBUS Gateways can be commissioned respectively programmed with the help of the software "AS-i Control Tools" in combination with the PROFIBUS-DP Master Simulator. The GSD file are included in the package.

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Commissioning, debugging and setting up of the AS-i parameters without the software can only be accomplished with the use of the push-buttons, the display and the LEDs directly on the system.

**Accessories:**

Software "AS-i Control Tools" ASI-CT210 (Article no. 6022501)

PROFIBUS-DP Master Simulator DP V0 PR-MVSV0 (Article no. 6022458)

PROFIBUS-DP Master Simulator DP V1 PR-MVSV1(Article no. 6022459)

D-Sub data transmission cord for AS-i masters in IP65 (Article no. 6022469)

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# 4 Connections, Displays and Operating Keys

Devices in IP20:

On the front panel of the AS-i/PROFIBUS gateways in IP20 are:

- terminals to connect the power supply and the AS-i circuit
- a 9-pin SUB-D connector as PROFIBUS interface
- 7 LEDs
- a LC display
- 2 push-buttons (devices with full-graphic display: 4 push-buttons) to configure the gateway

Devices in IP65:

The devices in IP65 have the terminals for PROFIBUS (cage clamp terminals) and the push buttons under the top of the housing to prevent liquids from entering. The AS-interface is connected with the electromechanical interface with penetration technique developed for AS-i at the bottom of the housing.

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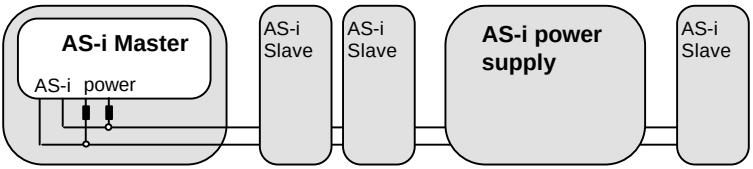
## 4.1 Power Supply Concepts and AS-i Connection Techniques

Note

*The AS-i masters do not need a voltage supply of their own. They can be powered completely out of the AS-i line (the power consumption is about 200 mA from AS-i). An additional 24 V voltage source is not necessary. The AS-i master merely requires the connection to the AS-i line. When the AS-i power supply is switched on, the master starts to operate.*

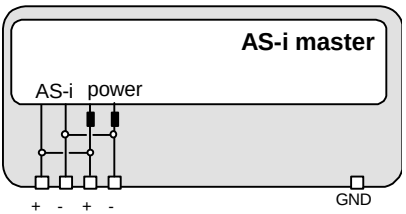
An AS-i power supply has to be used which also supplies the AS-i master with power and can be connected to the AS-i cable like all the other AS-i components at any place.

### 4.1.1 Single Masters in IP65




Every AS-i master and all the AS-i gateways in IP65 come with power supply A. The AS-i master is connected to AS-i using the penetration technique of the electromechanical interface which is common with AS-i slaves as well.

### 4.1.2 Single Masters in IP20 with AS-i Power Supply




The terminals have the following functions:

| | |
|---|---|
| + | "AS-i +", Actuator Sensor Interface, positive terminal |
| - | "AS-i -", Actuator Sensor Interface, negative terminal |
| GND | Ground terminal, used for better EMC.<br>Should be connected with a short wire to machine GND. |

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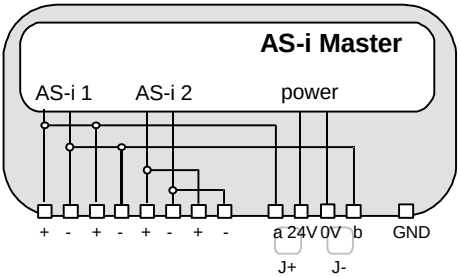
### 4.1.3 Double Master in IP20 with AS-i Power Supply




The terminals have the following functions:

| | |
|---|---|
| + | "AS-i +", Actuator Sensor Interface 1 or 2, positive terminal<br>These terminals are connected internally with point a2 of jumper "J+". |
| - | "AS-i -", Actuator Sensor Interface 1 or 2, negative terminal<br>These terminals are connected internally with point b2 of jumper "J-". |
| 24V | Master power supply, positive terminal (18 - 31.6 V DC) |
| 0V | Master power supply, negative terminal |
| GND | Ground terminal, used for better EMC.<br>Should be connected with a short wire to machine GND. |
| J+, J- | Jumpers for selecting the power supply of AS-i |

jumpers closed:

The AS-i master is powered out of AS-i circuit 1.
Master power supply and AS-i network are then decoupled with coils.

jumpers open:

With the jumpers open (or missing), the AS-i master must be powered by a separate 24 V DC power supply.

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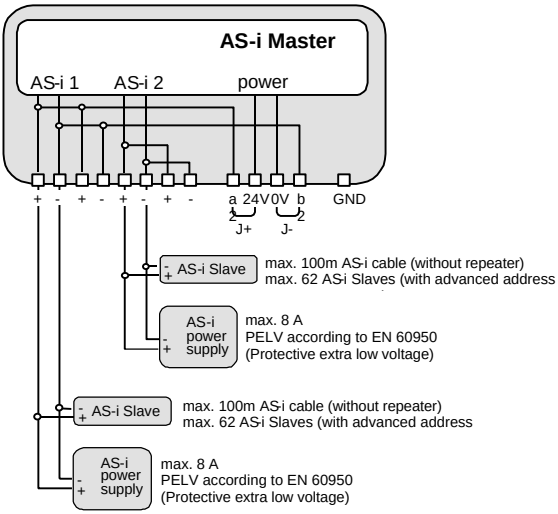
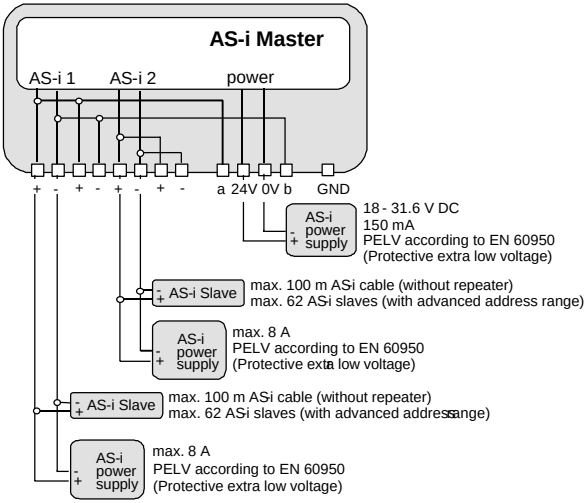
### Power supply out of AS i circuit 1




### Operation with separate 24 V DC power supply


AS-i Master
AS-i 1
AS-i 2
power
+ - + - + - + -
a 24V 0V b GND
AS-i power supply
18 - 31.6 V DC
150 mA
PELV according to EN 60950
(Protective extra low voltage)
AS-i Slave
max. 100 m ASi cable (without repeater)
max. 62 ASi slaves (with advanced address range)
AS-i power supply
max. 8 A
PELV according to EN 60950
(Protective extra low voltage)
AS-i Slave
max. 100 m ASi cable (without repeater)
max. 62 ASi slaves (with advanced address range)
AS-i power supply
max. 8 A
PELV according to EN 60950
(Protective extra low voltage)

***Do not use a seperate 24 V DC power supply without removing the jumpers***

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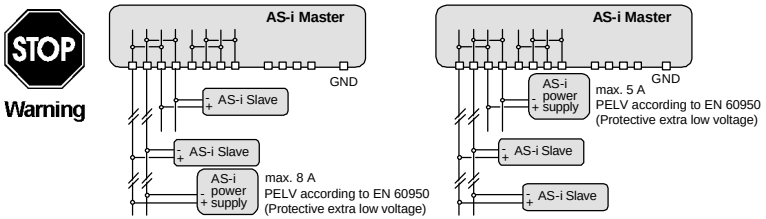
Connection variations for the AS-i circuits (here only displayed for one AS-i circuit)

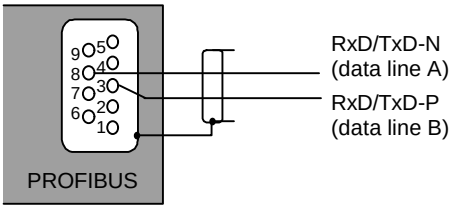


***In the wiring schemes above the current through the AS-i master must not exceed 5 A.***

## 4.2 The PROFIBUS Interface

### 4.2.1 Devices in IP20

The PROFIBUS interface is realized as a 9-pin SUB-D connector, in accordance to the standard for PROFIBUS DIN 19245. It is placed on the right hand side of the front panel.




The AS-i/PROFIBUS gateway sends and receives on pins 3 and 8 of the SUB-D socket. The PROFIBUS signal “RxD/TxD-N (data line A)[1]” lies on pin 8, the signal “RxD/TxD-P (data line B)[1]” lies on pin 3.

The pins 5 (0 V) and 6 (5 V) supply 5 V DC for the bus termination.

**Bus termination**

If the AS-i/PROFIBUS gateway is at the end of the PROFIBUS line, the termination resistors in the PROFIBUS connector have to be switched on.

### 4.2.2 Devices in IP65

The AS-i/PROFIBUS gateway in IP65 can be connected to PROFIBUS with cage clamp terminals inside of the device. For that purpose the top of the housing has to be screwed off.

1. If you measure the DC voltage between RxD/TxD-P (data line B) and RxD/TxD-N (data line A), RxD/TxD-P (data line B) is the positive pole when the bus is silent.

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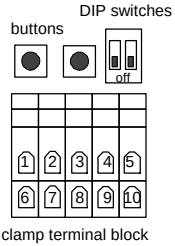
You can use a SUB-D data cable as an accessory part for AS-i masters in IP65 (DOL-RS485-02M) which is led through the heavy gauge terminals and is connected after the following colour scheme:

3 - green, 4 - yellow, 5 - blue, 10 - red

Connection of PROFI-BUS interface on cage clamp terminal block and arrangement on circuit board:

| | |
|---|---|
| 1 | RxD/TxD-N (data line A) |
| 2 | RxD/TxD-P (data line B) |
| 3 | RxD/TxD-N (data line A) |
| 4 | RxD/TxD-P (data line B) |
| 5 | 0 V |
| 6 | Shield |
| 7 | FG function ground |
| 8 | FG function ground |
| 9 | Shield |
| 10 | +5 V |




The device in IP65 is powered out of the AS-i line to which it is connected by the electromechanical interface (penetration technique as it is used with AS-i slaves).

**Bus Termination**

If the AS-i/PROFIBUS gateway is at the end of the PROFIBUS line, both DIP-switches have to be switched on to terminate the bus with the built-in termination resistors.

If the gateway is not at the end of the line, swith off both DIP switches.

## 4.3 Display and Operating Elements

On the front panel of the AS-i/PROFIBUS gateway are seven light-emitting diodes, a two-digit display and two push buttons.

With the devices in IP65 the push buttons are situated inside of the housing to avoid liquids from entering. The top of the housing has to be screwed off to operate these push buttons.

### 4.3.1 LEDs of the Single Masters

power — The master's power supply is sufficient.

bus active — LED on: Gateway is allocated to a PROFIBUS master.
LED off: Gateway is not allocated to a PROFIBUS master.

config err — Configuration error
At least one configured slave is missing, or at least one detected slave is not projected or for at least one projected and detected slave the actual configuration data does not match the nominal configuration data.
This LED blinks if there is at least one periphery fault at one AS-i slave in the AS-i network. If there are configuration errors as well as periphery faults, only configuration error is displayed.

U ASI — The AS-i circuit is sufficiently powered.

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| | |
|---|---|
| ASI active | Normal operation active.<br>(Blinks, if an B slave is displayed) |
| prg enable | Automatic address programming enabled.<br>Exactly one slave is missing in protected operating mode. The slave can be replaced by another slave of the same type with address zero. The master addresses the new slave to the faulty address and thus eliminates the configuration error. |
| prj mode | The AS-i master is in configuration mode. |

### 4.3.2 LEDs of the Double Masters

| | |
|---|---|
| AS-i 2 | Switching of the displays and push buttons between the two AS-i circuits.<br>If this LED lights up, all displays and button operations are related to AS-i circuit 2, otherwise AS-i circuit 1. |
| bus active | LED on: Gateway is allocated to a PROFIBUS master.<br>LED off: Gateway is not allocated to a PROFIBUS master. |
| config err | Configuration error<br>At least one configured slave is missing, or at least one detected slave is not projected or for at least one projected and detected slave the actual configuration data does not match the nominal configuration data.<br>This LED blinks if there is at least one periphery fault at one AS-i slave in the AS-i network. If there are configuration errors as well as periphery faults, only configuration error is displayed. |
| power | The master's power supply is sufficient. |
| U ASI | The AS-i circuit is sufficiently powered. |
| prg enable | Automatic address programming enabled.<br>Exactly one slave is missing in protected operating mode. The slave can be replaced by another slave of the same type with address zero. The master addresses the new slave to the faulty address and thus eliminates the configuration error. |
| prj mode | The AS-i master is in configuration mode. |

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# 5 Operating the AS-i/PROFIBUS Gateway

## 5.1 Peculiarities with Double Masters

Note

*In **protected mode** the displays of the double Masters are switched over from AS-i circuit 1 to AS-i circuit 2 in a measure of 2 seconds.*

In **configuration mode** all detected AS-i slaves are displayed at first before the display switches to the other AS-i circuit.

The operation of the push buttons is always related to the currently displayed AS-i circuit (LED AS-i 1/AS-i 2). After a push button was pressed the display stays with the respective AS-i circuit until the operation is finished or the operator has not interfered for 10 seconds.

## 5.2 Master Start-Up

After powering on, all segments of the figure display and all LEDs light up for approximately one second (self-test). Afterwards, the LEDs display the condition of their respective flags. The figure display shows the condition of the master:

40 Off-line Phase
The AS-i master initializes - there is no data communication on the AS-i.

Attention

***If the AS-i circuit is insufficiently powered ("U AS-i" does not light up)** or there is no communication relationship between the PROFIBUS master and the AS-i/PROFIBUS gateway**, the master remains in the off-line phase.***

In configuration mode or when an AS-i Control program is started automatically the device can leave the off-line phase.
In protected mode, if the PROFIBUS communication is interrupted, the AS-i master switches to the off-line phase after the watchdog time of the PROFIBUS has expired unless an AS-i Control program is running and was started automatically.

41 Detection Phase
Start of the start-up phase, where the system looks for slaves located on the AS-i. The master remains in the detection phase until it finds at least one slave.

42 Activation Phase
Condition at the end of the start-up operation where the parameters are transmitted to all connected and recognized slaves. This enables access to the AS-i slaves' data connections.

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43[1] Start of Normal Operation
In normal operation the AS-i master can exchange data with all active slaves. It transmits management messages and looks for and activates newly connected slaves. During normal operation, the system keeps the maximum cycle time of 5 milliseconds.

## 5.3 Configuration Mode

The configuration mode serves to configure the AS-i circuit.

*In the configuration mode, all recognized slaves are activated even when the desired and actual configurations do not match.*

Pressing the “mode” button for at least five seconds switches the master to configuration mode. While in configuration mode, the yellow “prj mode” LED lights up.

The system then displays one after the other all detected slaves at a speed of two per second. First all "A" slaves and afterwards all "B" slaves. If the display is empty, no slaves were detached on the AS-i circuit.

In configuration mode, all recognized slaves are activated except of slave zero. The AS-i master is in normal operation. There is data exchange between the AS-i master and all AS-i slaves detected by the master regardless of whether the detected AS-i slaves were projected before.

*When delivered the device is in configuration mode.*

## 5.4 Protected Operating Mode

*In contrast with the configuration mode in the protected mode there is only data exchange between the AS-i master and the projected AS-i slaves.*

### 5.4.1 Switching to Protected Operating Mode

The configuration mode can be left by pressing the “mode” button.

Pressing the button shortly:
Exits the configuration mode without projecting the current AS-i configuration.

Pressing the button for more than five seconds:
Exits the configuration mode and projects the actual AS-i configuration. Simul-

1. Activation phase and the start of normal operation maybe so short that the numbers can not be seen in the display.

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taneously the actual AS-i configuration is stored as nominal configuration in the EEPROM.

Note

*If the system detects an AS-i slave with address zero on the AS-i, it can not leave the configuration mode.*

In the protected operating mode, only AS-i slaves that are projected and whose actual configurations match the nominal configurations will be activated.

### 5.4.2 Configuration Errors in Protected Operating Mode

As long as there is no configuration error, the numeric display is turned off while in protected operating mode. Otherwise, the address with a faulty assignment is displayed. A faulty assignment occurs when a slave has been recognized or projected but cannot be activated.

If there are more than one faulty assignments the one that was first detected is displayed. Pressing the “set” button shortly displays the next higher faulty address.

Shortly appearing configuration errors are stored in the device (advanced AS-i diagnosis). The last error that occurred can be displayed by pressing the set button. If a short AS-i power failure is responsible for the configuration error the display shows a “39”.

## 5.5 Assigning an AS-i Address in Configuration Mode

AS-i can be put into operation in a very comfortable manner by using the Windows software AS-i Control Tools ASI-CT210 (see chapter 8.1).

Furthermore you can use a hand held addressing device.

If you don’t have neither a PC nor a hand held addressing device, address assigning of the AS-i slaves is also possible with the AS-i/PROFIBUS gateway using the push buttons. How it works is described as follows.

### 5.5.1 Assigning a Slave Address

(assigning an available address to a slave with address zero)

In configuration mode, the addresses of all detected slaves are displayed one after the other. To display the next higher available operating address, press the “set” button shortly. Each time you press the “set” button, the next available address is displayed.

Choose the displayed address as your target address by pressing the button for more than five seconds. The address display blinks. The master is ready for programming; pressing the “set” button again addresses the connected slave with address zero to the target (blinking address).

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Any errors will be displayed by their error codes according to chapter 9. Otherwise, the detected slaves are displayed again as described in chapter 5.3..

Note

*Only slaves with address 0 can get a new address by the master.*

Attention

*There must not be two AS-i slaves with the same adrress on the AS-i circuit.*

### 5.5.2 Erasing the Slave Address

(assigning address zero to a detected slave)

In configuration mode, the addresses of all recognized slaves are displayed one after the other. By pressing and releasing the “set” button, the master displays the next available address. If you press the button for more than five seconds while the address of a detected slave is displayed, this slave will get the address zero and the display shows “00”.

When you release the button, the display continues to display the detected slaves.

## 5.6 Programming the Address in Case of Configuration Errors

### 5.6.1 Automatic Address Assignment

Note

*One of AS-i’s great advantages is the automatic address assignment. If a slave fails, it can be replaced by one of the same type with address zero. The master will detect the replacement and automatically addresses the new slave with the address of the faulty one.*

For automatic programming to work, some requirements must be met:

1. The AS-i master must be in the protected operating mode.
2. The “Auto_Address_Assign” release flag must be set.
3. Only one of the projected slaves may not be detected.

If these requirements are met, the AS-i master’s “**prg enable**” LED lights up and a slave with address zero will be automatically assigned to the operating address of the missing slave. The "Automatic Address Assignment" can be activated and deactivated via the software "AS-i Control Tools".

Attention

*If the two slaves have different configuration data, i.e. are not of the same type as far as AS-i is concerned, the automatic address assignment will not be carried out.*

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### 5.6.2 Manual Address Assignment

Note

*If several slaves fail, they cannot be replaced automatically by the AS-i master. Then these addresses have to be set manually. If this should not be done via the host interface (using the AS-i Control Tools) or with a hand held addressing device, the slave addresses can also be changed with the help of the push buttons and the figure display of the device.*

In protected operating mode, wrong assignments are displayed as errors (see chapter 5.4). By pressing the “set” button, you can display all faulty assignments one after the other. By pressing the “set” button for more than five seconds, you can select the currently displayed address as a potential target address, and the display starts to blink.

If the faulty slave was previously replaced by a slave with address zero, the new slave can now be programmed for the blinking address by pressing the “set” key again. As a requirement, the new slave’s configuration data must match the configuration data for the blinking address.

After the address has been successfully set, the next faulty assignment is displayed and the address assignment can begin from the start. Otherwise, the system displays an error code (chapter 9). When all faulty assignments are eliminated the display is empty.

## 5.7 Setting of the PROFIBUS Station Address

### 5.7.1 PROFIBUS Station Address

Note

*The addressing of the AS-i/PROFIBUS gateway as a PROFIBUS slave can be done locally at the gateway or via PROFIBUS according to the PROFIBUS standard.*

For example the PROFIBUS DP Master Simulator DP V0/DP V1 (PR-MVSV0/PR-MSV1) can be used to change the AS-i/PROFIBUS gateway's station address via PROFIBUS.

Station addresses from 1 to 99 can be set, when delivered station address 3 is set.

For the relocation, both the “set” button and the “mode” button have to be pushed simultaneously for at least 5 seconds until the current bus address is shown on the LCD display. With every pushing of the “set” button, the station address can now be increased by 1.

Once the desired PROFIBUS station address is shown on the display, it will be stored non-volatile in the EEPROM by pushing the “mode” button.

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## 5.8 Error Messages

*The system displays error codes for error messages that do not point to faulty assignments on the AS-i circuit. The code numbers are larger than 50 and are therefore outside the slave address range. These codes are described in the appendix, chapter 9.*

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# 6 Advanced Diagnostics for AS-i Masters

The advanced AS-i diagnostics serve to locate occasionally occurring errors and to judge the quality of data transmission on AS-i without additional diagnostics tools.

The "AS-i Control Tools" (software for the comfortable commissioning of the AS-Interface and the programming of AS-i Control) support the operation of the advanced diagnostics (LCS, error counters and LOS).

## 6.1 List of Corrupted AS-i Slaves (*LCS*)

To locate occasionally occurring short-time configuration errors the AS-i masters with advanced diagnostics manage beside the list of projected slaves (*LPS*), the list of detected slaves (*LDS*) and the list of activated slaves (*LAS*) a forth list, the **list of corrupted slaves (*LCS*)**. This list contains entries of all AS-i slaves which were responsible for at least one configuration error since powering up the AS-i master or reading the list. Short-time AS-i power failures are represented in the *LCS* at the position of AS-i slave with address 0.

Note

*With every read access the LCS will be deleted.*

Note

*The last short-time configuration error can also be displayed on the AS-i Master:*
*Pressing the “set” button of the AS-i master shows the AS-i slave which was responsible for the last short-time configuration error. If there was a short-time AS-i power failure the display shows “39” after pressing the “set” button.*
*This function is only available if device is in the normal operation mode of the protected mode (display empty) or in the off-line-phase.*

## 6.2 Protocol Analysis: Counters of Corrupted Data Telegrams

The AS-i master with advanced diagnostics has a counter of telegram repetitions for each AS-i slave, which is increased everytime there is a corrupted data telegram. This makes possible to judge the quality of the AS-i network, even if only a few corrupted telegrams occured and the AS-i slave did not cause any configuration errors.

Note

*The counter values can be read via the host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.*

The protocol analysis is included in the command master | AS-i Diagnostics of "AS-i Control Tools".

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## 6.3 Off-line Phase on Configuration Errors (LOS)

The AS-i masters with advanced diagnostics offer the possibility to put themselves into the off-line Phase when a configuration error on the AS-Interface occurs. In this way the security of the application can be ensured. The reaction to a configuration error is very fast and the host can be relieved from this task. If there are any problems on the AS-i network, the AS-interface can be switched to a secure state.

There are two different ways to parameterize the AS-i master for this feature:

- Every configuration error during normal operation in protected mode releases the off-line phase.
- For each slave address can be chosen whether a configuration error on this address will release the off-line phase or not. This information is stored in the List of Off-line Slaves (*LOS*).
  The user himself can decide how the system reacts to a configuration error on the AS-Interface. The AS-i master can release the off-line phase in critical situations, i. e. only with certain slave addresses, while in less critical situations (if one of the other AS-i slaves have a configuration error) only the error message configuration error is sent to the host, but AS-i is still running.

The parameterization of off-line phase on configuration error is also supported by the "AS-i Control Tools" (command Master | Identity | Offline on configuration error).

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# 7 PROFIBUS-DP

This chapter contains all the necessary information to operate the AS-i/PROFIBUS gateway in a PROFIBUS-DP network.

## 7.1 DP Telegrams

### 7.1.1 Diagnosis

| DP Diagnosis | | | | | |
|---|---|---|---|---|---|
| PDU byte | user byte | | DP | DPV1 | user |
| 1 | – | station_status 1 | ✔ | | |
| 2 | – | station_status 2 | ✔ | | |
| 3 | – | station_status 3 | ✔ | | |
| 4 | – | master address | ✔ | | |
| 5 | – | ident high | ✔ | | |
| 6 | – | ident low | ✔ | | |
| 7 | 1 | header | ✔ | ✔ | |
| 8 | 2 | type | | ✔ | |
| 9 | 3 | slot | | ✔ | |
| 10 | 4 | spec | | ✔ | |
| 11 | 5 | ec-flags (high) | | | ✔ |
| 12 | 6 | ec-flags (low) | | | ✔ |
| 13 | 7 | delta (0…7) | | | ✔ |
| 14 | 8 | delta (8…15) | | | ✔ |
| … | … | … | | | |
| 20 | 14 | delta (56…63) | | | ✔ |
| 21 | 15 | LPF (0…7) | | | ✔ |
| … | … | … | | | |
| 28 | 22 | LPF (56…63) | | | ✔ |
| 29 | 23 | LCS (0…7) | | | ✔ |
| … | … | … | | | |
| 36 | 30 | LCS (56…63) | | | ✔ |

ec-flags (high):

Bit 0: periphery fault

ec-flags (low):

Bit 0: configuration error
Bit 1: slave with address0 detectd
Bit 2: Auto_address_assignment not possible
Bit 3: Auto_address_assingment available
Bit 4: configuration mode actice
Bit 5: not in normal operation
Bit 6: AS-i power fail
Bit 7: AS-i master is offline

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Delta List: List of AS-i slaves with configuration error:
1: ConfigError
0: no ConfigError

LPF:List of AS-i slaves with periphery fault:
1: periphery fault
0: no periphery fault

LCS: List of Corrupted slaves (see chapter 6).

Each element of the user diagnosis (ec-flags and slave lists) can be switched off by setting the appropriate bit in the parameter telegram.

Each element that is not used will be filled up with zeros. This way the data elements in the diagnosis telegram will keep its designated position (and clear text diagnosis fits to the data furthermore).

Only if an element at the end of the user diagnosis is not used, the length of the diagnosis will be shortened.

Extdiag will be set if at least one of the following conditions is fulfilled:

- ConfigError ≡ 1
- APF ≡ 1
- PeripheryFault ≡ 1
- LCS is not empty

The conditions when to set the ExtDiag bit can be chosen using the user parameters or the mailbox commands.

The GSD file includes the following presettings:

- The PROFIBUS diagnosis displayes: EC-flags, delta list and LPF. The LCS is not displayed.
- ExtDiag will be set if ConfigError =1 and APF = 1. ExtDiag will not be set if there is a periphery fault or if there is an entry in the LCS.

If an AS-i/PROFIBUS-DP Gateway with 2 AS-i masters is used, the User-Diagnosis-Bytes 5 to 30 represent AS-i network 1 and the User-diagnosis bytes 31 to 56 represent AS-i network 2.

**User Parameters**

With the User Paramters can be selected which slave liste will be displayed in the PROFIBUS diagnosis. Furthermore can be selceted which conditions have to be fulfilled to set the ExtDiag bit within the diagnosis telegram.

| DP Parameters | | | | | | |
|---|---|---|---|---|---|---|
| PDU byte | user byte | | DP | DPV1 | user | default |
| 1 | – | station_status | ✔ | | | |
| 2 | – | WD_Fact_1 | ✔ | | | |
| 3 | – | WD_Fact_2 | ✔ | | | |
| 4 | – | min $T_{sdr}$ | ✔ | | | |
| 5 | – | ident high | ✔ | | | |
| 6 | – | ident low | ✔ | | | |

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| DP Parameters | | | | | | |
|---|---|---|---|---|---|---|
| PDU byte | user byte | | DP | DPV1 | user | default |
| 7 | – | group_ident | ✔ | | | |
| 8 | 1 | DPV status 1 | | ✔ | | $80_{16}$ |
| 9 | 2 | DPV status 2 | | ✔ | | $00_{16}$ |
| 10 | 3 | DPV status 3 | | ✔ | | $00_{16}$ |
| 11 | 4 | slave lists | | | ✔ | $0B_{16}$ |
| 12 | 5 | ExtDiag | | | ✔ | $06_{16}$ |

The bits in "slave lists" and "ExtDiag" have following meanings:

| Slave lists | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| | – | | | LCS | LPF | – | D | F |
| default | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |

| ExtDiag | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| | – | | | CS | PF | APF | CF | – |
| default | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |

LCS: 1: LCS will be displayed in PROFIBUS diagnosis
0: LCS will not be displayed

LPF: 1: LPF will be displayed in PROFIBUS diagnosis
0: LPF will not be displayed

D: 1: Delta list will be displayed in PROFIBUS diagnosis
0: Delta list will not be displayed

F: 1: EC flags will be displayed in PROFIBUS diagnosis
0: EC flags will not be displayed

CS: 1: ExtDiag will be set, if there is an entry in the LCS
0: ExtDiag will not be set, if there is an entry in the LCS

PF: 1: ExtDiag will be set, if there is a periphery fault at the AS-i line
0: ExtDiag will not be set.

APF: 1: ExtDiag will be set, if there is an AS-i Power Fail
0: ExtDiag will not be set.

CF: 1: ExtDiag will be set, if there is an Configuration error at the AS-i line
0: ExtDiag will not be set.

The GSD's default user parameter telegram is:

| | | | | |
|---|---|---|---|---|
| $80_{16}$ | $00_{16}$ | $00_{16}$ | $0B_{16}$ | $06_{16}$ |

(DPV1 enabled, diagnosis settings according chapter 7.1.1)

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### 7.1.2 Configuration DP V0 (cyclic data)

#### AS-i V2.04 easy mode

Note

*The AS-i/PROFIBUS-DP Gateway V2.1 can be used that it can replace Bihl+Wiedemann's AS-i/PROFIBUS-DP Gateway according to the specification 2.04 which has been commisioned in easy mode. In this mode the AS-i I/O data are shown in the PROFIBUS process data as 16 bytes I/O data with or without consistency.*

The PROFIBUS diagnosis is displayed as described in chapter 7.1.1.

Even if the PROFIBUS-DP gateway V2.1 shall be used in this V2.04 easy mode, the GSD file which comes together with the gateway has to be used. The GSD file of the V2.04 gateway can not be used.

#### AS-i V2.1 mode

In AS-i V2.1 mode the input and output data field can be used with variuos "special IDs".

The advantages of special input and output IDs are: They can include up to 64 elements (bytes or words) and the length of input and output data can be different. Furthermore "manufacturer specific" data bytes are possible. These "manuafaturer specific" data bytes describe the which type ID is.

The following types are possible:

| Areas of the I/O-data fields | | | |
|---|---|---|---|
| type | | input data length (bytes) | output data length (bytes) |
| $00_{16}$ | empty | 0…128 | 0…128 |
| $01_{16}$ | digital process data out of AS-i circuit 1 | 0…32 | 0…32 |
| $02_{16}$ | digital process data out of AS-i circuit 2 | 0…32 | 0…32 |
| $03_{16}$ | mailbox | 2…36 | 2…34 |
| $10_{16}$ | analog input data circuit 1, slave 31 | 2…128 | 0 |
| $11_{16}$ | analog input data circuit 1, slave 15 | 2…120 | 0 |
| $12_{16}$ | analog output data circuit 1, slave 31 | 0 | 2…128 |
| $13_{16}$ | analog output data circuit 1, slave 15 | 0 | 2…120 |
| $14_{16}$ | analog input data circuit 2, slave 31 | 2…128 | 0 |
| $15_{16}$ | analog input data circuit 2, slave 15 | 2…120 | 0 |
| $16_{16}$ | analog output data circuit 2, slave 31 | 0 | 2…128 |
| $17_{16}$ | analog output data circuit 2, slave 15 | 0 | 2…120 |

The consistency of the digital process data is ignored. At least each word of the analog data has to be consistent. The mailbox commands have to be consistent. The GSD file submits the corresponding entry.

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The IDs can be used in different sequences. But in the I/O data field can only be one area with each type.

### 7.1.3 I/O-Data

**AS-i V2.04 easy mode**

| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|---|---|---|---|
| 0 | slave 1/1A | | | | flags | | | |
| | D3 | D2 | D1 | D0 | F3 | F2 | F1 | F0 |
| 1 | slave 3/3A | | | | slave 2/2A | | | |
| 2 | slave 5/5A | | | | slave 4/4A | | | |
| 3 | slave 7/7A | | | | slave 6/6A | | | |
| 4 | slave 9/9A | | | | slave 8/8A | | | |
| 5 | slave 11/11A | | | | slave 10/10A | | | |
| 6 | slave 13/13A | | | | slave 12/12A | | | |
| 7 | slave 15/15A | | | | slave 14/14A | | | |
| 8 | slave 17/17A | | | | slave 16/16A | | | |
| 9 | slave 19/19A | | | | slave 18/18A | | | |
| 10 | slave 21/21A | | | | slave 20/20A | | | |
| 11 | slave 23/23A | | | | slave 22/22A | | | |
| 12 | slave 25/25A | | | | slave 24/24A | | | |
| 13 | slave 27/27A | | | | slave 26/26A | | | |
| 14 | slave 29/29A | | | | slave 28/28A | | | |
| 15 | slave 31/31A | | | | slave 30/30A | | | |

**AS-i V2.1 mode**

Process data

**Note**

In V2.1 mode the AS-i I/O data are mapped in the PROFIBUS process data as known from the Siemens and AS-i/InterBus masters. That means the lower nibble describes the data of the AS-i slave with the higher slave address. The EC flags resp. HI-flags are additionaly mapped at the nibble of AS-i slave 0.

| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|---|---|---|---|
| 0 | flags | | | | slave 1/1A | | | |
| | F3 | F2 | F1 | F0 | D3 | D2 | D1 | D0 |
| 1 | slave 2/2A | | | | slave 3/3A | | | |
| 2 | slave 4/4A | | | | slave 5/5A | | | |
| 3 | slave 6/6A | | | | slave 7/7A | | | |
| 4 | slave 8/8A | | | | slave 9/9A | | | |
| 5 | slave 10/10A | | | | slave 11/11A | | | |
| 6 | slave 12/12A | | | | slave 13/13A | | | |

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| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|---|---|---|---|
| 7 | slave 14/14A | | | | slave 15/15A | | | |
| 8 | slave 16/16A | | | | slave 17/17A | | | |
| 9 | slave 18/18A | | | | slave 19/19A | | | |
| 10 | slave 20/20A | | | | slave 21/21A | | | |
| 11 | slave 22/22A | | | | slave 23/23A | | | |
| 12 | slave 24/24A | | | | slave 25/25A | | | |
| 13 | slave 26/26A | | | | slave 27/27A | | | |
| 14 | slave 28/28A | | | | slave 2929A | | | |
| 15 | slave 30/30A | | | | slave 31/31A | | | |
| 16 | reserved | | | | slave 1B | | | |
| 17 | slave 2B | | | | slave 3B | | | |
| 18 | slave 4B | | | | slave 5B | | | |
| 19 | slave 6B | | | | slave 7B | | | |
| 20 | slave 8B | | | | slave 9B | | | |
| 21 | slave 10B | | | | slave 11B | | | |
| 22 | slave 12B | | | | slave 13B | | | |
| 23 | slave 14B | | | | slave 15B | | | |
| 24 | slave 16B | | | | slave 17B | | | |
| 25 | slave 18B | | | | slave 19B | | | |
| 26 | slave 20B | | | | slave 21B | | | |
| 27 | slave 22B | | | | slave 23B | | | |
| 28 | slave 24B | | | | slave 25B | | | |
| 29 | slave 26B | | | | slave 27B | | | |
| 30 | slave 28B | | | | slave 29B | | | |
| 31 | slave 30B | | | | slave 31B | | | |

| **Flags** | | |
|---|---|---|
| | input data | output data |
| F0 | ConfigError | Off-line |
| F1 | APF | LOS-master-bit |
| F2 | PeripheryFault | → ConfigurationMode |
| F3 | ConfigurationActive | → ProtectedMode |

ConfigError: 0=ConfigOK, 1=ConfigError
APF: 0=AS-i-Power OK, 1=AS-i-Power Fail
PeripheryFault: 0=PeripheryOK, 1=PeripheryFault
ConfigurationActive: 0=ConfigurationActive, 1=ConfigurationInactive
Off-Line: 0=OnLine, 1=Off-Line
LOS-master-bit 0=Off-Line by ConfigError deactivated
1=Off-Line by ConfigError deactivated

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A rising edge of the "LOS master bit" effects that all bits in the LOS are set. A falling edge effects that all bits are reset.

Analog data

The 16 bit values of AS-i slaves according to the profile 7.3 can read and written within each PROFIBUS cycle or via the mailbox.

If analog values are written cyclic and acyclic via the mailbox or via DPV1 at the same time, the values transmitted cyclically will overwrite the acyclic values.

AS-i analog data 7.3 may be mapped in a separate area to provide easy access.

| **Analog data** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | slave 31-n/8, channel 1, high byte | | | | | | | |
| 2 | slave 31-n/8, channel 1, low byte | | | | | | | |
| 3 | slave 31-n/8, channel 2, high byte | | | | | | | |
| 4 | slave 31-n/8, channel 2, low byte | | | | | | | |
| … | … | | | | | | | |
| n-1 | slave 31, channel 4, high byte | | | | | | | |
| n | slave 31, channel 4, low byte | | | | | | | |

Mailbox

Only using the IDs of the process data field the AS-i/PROFIBUS gateway can be used as M0 AS-i master. Using the mailbox (see chapter 7.1) the functions of a M3 master are avaiable.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | request parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 36 | request parameter byte 34 | | | | | | | |

| **Answer** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command (mirrored) | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | response parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 34 | response parameter byte 32 | | | | | | | |

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A mailbox command will be treated if the toggle bit T has changed. In that way the same command can be used many times.

The mailbox commands can also be activated with PROFIBUS-DP V1. Even the process data exchange is possible via the mailbox. In that way the configuration software "AS-i Control Tools" can run the whole communication via DP V1.

## 7.2 DP V1

To exchange data between the PROFIBUS master and the AS-i/PROFIBUS gateway via PROFIBUS-DP V1 only one data block is used - slot 1, index 16. Within this data block a mailbox is installed like the one used in the DP telegram.

The DP V1-mailboxes are processed every time they are called. Therefore it is possible, to execute the same command several times without changing "command" or "circuit".

## 7.3 Mailbox

### 7.3.1 Construction

If an AS-i slave is addressed in a command or in a response, the address is structured as shown below:

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | request parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 36 | request parameter byte 34 | | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | command | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | response parameter byte 1 | | | | | | | |
| … | … | | | | | | | |
| 34 | response parameter byte 32 | | | | | | | |

Command byte and T-bit are always part of the response. The T-bit is necessary to operate the mailbox via a MSC1 connection (PROFIBUS-DP V0). In that way the same mailbox command can be used two times directly one command after the other with different parameters.

The execution of a mailbox command is declined, if the number of the transfered parameters is too small, that means the mailbox in the cyclic channel is too small or the DP V1-telegram is too short.

The mailbox commands are valid as well for PROFIBUS DP V0 as PROFIBUS DP V1.

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Circuit = 0 If AS-i gateway with one AS-i master or the master 1 of an AS-i gateway with 2 masters is choosen.

Circuit = 1 If AS-i gateway with 2 masters and the master 2 is choosen.

Values for command

| Values for command | | | | | |
|---|---|---|---|---|---|
| | **value** | **meaning** | **Req Len** | **Res Len** | **ACC Grp** |
| IDLE | $00_{16}$ | No order | 2 | 2 | A |
| READ_IDI | $41_{16}$ | Read IDI | 2 | 36 | A |
| WRITE_ODI | $42_{16}$ | Write_ODI | 34 | 2 | D |
| SET_PP | $43_{16}$ | Set_Permanent_Parameter | 4 | 2 | C |
| GET_PP | $01_{16}$ | Get_Permanent_Parameter | 3 | 3 | A |
| WRITE_P | $02_{16}$ | Write_Parameter | 4 | 3 | C |
| READ_PI | $03_{16}$ | Read_Parameter | 3 | 3 | A |
| STORE_PI | $04_{16}$ | Store_Actual_Parameter | 2 | 2 | C |
| SET_PCD | $25_{16}$ | Set_Permanent_Config | 5 | 2 | C |
| GET_PCD | $26_{16}$ | Get_Permanent_Config | 3 | 4 | A |
| STORE_CDI | $07_{16}$ | Store_Actual_Configuration | 2 | 2 | C |
| READ_CDI | $28_{16}$ | Read_Actual_Configuration | 3 | 4 | A |
| SET_LPS | $29_{16}$ | SET_LPS | 11 | 2 | C |
| GET_LPS | $44_{16}$ | Get_LPS | 2 | 10 | A |
| GET_LAS | $45_{16}$ | Get_LAS | 2 | 10 | A |
| GET_LDS | $46_{16}$ | Get_LDS | 2 | 10 | A |
| GET_FLAGS | $47_{16}$ | Get_Flags | 2 | 5 | A |
| SET_OP_MODE | $0C_{16}$ | Set_Operation_Mode | 3 | 2 | C |
| SET_OFFLINE | $0A_{16}$ | Set_Offline_Mode | 3 | 2 | D |
| SET_DATA_EX | $48_{16}$ | Set_Data_Exchange_Active | 3 | 2 | C |
| SLAVE_ADDR | $0D_{16}$ | Change_Slave_Address | 4 | 2 | C |
| SET_AAE | $0B_{16}$ | Set_Auto_Adress_Enable | 3 | 2 | D |
| EXEC_CMD | $49_{16}$ | Execute_Command | 4 | 3 | C |
| GET_LPF | $3E_{16}$ | Get_LPF | 2 | 10 | A |
| WRITE_XID1 | $3F_{16}$ | Write_Extended_ID-Code_1 | 3 | 2 | C |
| RD_7X_IN | $50_{16}$ | Read 1 7.3-slave in.data | 3 | 10 | A |
| WR_7X_OUT | $51_{16}$ | Write 1 7.3-slave out.data | 11 | 2 | C |
| RD_7X_OUT | $52_{16}$ | Read 1 7.3-slave out.data | 3 | 10 | A |
| RD_7X_IN_X | $53_{16}$ | Read 4 7.3-slaves in.data | 3 | 34 | A |
| WR_7X_OUT_X | $54_{16}$ | Write 4 7.3-slaves out.data | 35 | 2 | C |

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| Values for command | | | | | |
|---|---|---|---|---|---|
| | **value** | **meaning** | **Req Len** | **Res Len** | **ACC Grp** |
| RD_7X_OUT_X | $55_{16}$ | Read 4 7.3-slaves out.data | 3 | 34 | A |
| READ_ODI | $56_{16}$ | Read ODI | 2 | 34 | A |
| GET_LISTS | $30_{16}$ | Get LDS, LAS, LPS, Flags | 2 | 29 | A |
| GET_LCS | $60_{16}$ | Get LCS | 2 | 10 | B |
| GET_LOS | $61_{16}$ | GET_LOS | 2 | 10 | A |
| SET_LOS | $62_{16}$ | SET_LOS | 10 | 2 | C |
| GET_TECA | $63_{16}$ | Get transm.err.counters | 2 | 34 | B |
| GET_TECB | $64_{16}$ | Get transm.err.counters | 2 | 34 | B |
| GET_TECX | $66_{16}$ | Get transm.err.counters | 4 | 34 | B |
| EXT_DIAG | $71_{16}$ | ExtDiag generation | 6 | 2 | A |
| OPTIONS | $74_{16}$ | Software options | 2 | 18 | A |
| BUTTONS | $75_{16}$ | Disable pushbuttons | 3 | 2 | A |
| RD_EXT_DIAG | $7B_{16}$ | Read ExtDiag Settings | 2 | 7 | A |
| INVERTER | $7C_{16}$ | Configure Inverter Slaves | 12 | 4 | C |

Values for results

| Values for result | | | |
|---|---|---|---|
| | value | place | meaning |
| OK | $00_{16}$ | – | execution without fault |
| HI_NG | $11_{16}$ | HI | general fault |
| HI_OPCODE | $12_{16}$ | HI | illegal value in command |
| HI_LENGTH | $13_{16}$ | HI | length of the mailbox in the I/O-data area respectively the length of the DPV1-Requests is too short |
| HI_ACCESS | $14_{16}$ | HI | no access right |
| EC_NG | $21_{16}$ | EC | general fault |
| EC_SND | $22_{16}$ | EC | „slave (source addr) not detected“ |
| EC_SD0 | $23_{16}$ | EC | „slave 0 detected“ |
| EC_SD2 | $24_{16}$ | EC | „slave (target addr) not decteced“ |
| EC_DE | $25_{16}$ | EC | „delete error“ |
| EC_SE | $26_{16}$ | EC | „set error“ |
| EC_AT | $27_{16}$ | EC | „address temporary“ |
| EC_ET | $28_{16}$ | EC | „extended ID1 temporary“ |
| EC_RE | $29_{16}$ | EC | „read (extended ID1) error“ |

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### 7.3.2 Mailbox commands

IDLE:

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $00_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $00_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

READ_IDI:

With this call the input data values of all AS-i slaves are read out of the AS-i/PROFIBUS Gateway in addition to the cyclic data exchange. Though the mail-box command READ_IDI transmits all Execution-Control-Flags (bytes 3 and 4).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $41_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $41_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | s0 | Cok |
| 5 | – | | | | slave 1A | | | |
| 6 | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 30 | slave 30B | | | | slave 31B | | | |

Pok Periphery_Ok
S0 LDS.0
AAs Auto_Address_Assign
AAv Auto_Address_Available
CA Configuration_Active
NA Normal_Operation_Active
APF APF
OR Offline_Ready
Cok Config_Ok

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WRITE_ODI:

With this call the output data values of all AS-i slaves are written in additon to the cyclic data exchange.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $42_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | | | slave 1A | | | |
| 4 | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 34 | slave 30B | | | | slave 31B | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $42_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Set_Permanent_Parameter (SET_PP):

With this call, a parameter value for the specified AS-i slave is configured on the AS-i/PROFIBUS Gateway. The value is stored permanently in the EEPROM of the Gateway.

The configured parameter is not transferred immediately by the AS-i/PROFIBUS Gateway to the AS-i slave. The configured parameter value is only transferred when the AS-i slave is activated after turning on the power supply on the AS-i/PROFIBUS Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $43_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | – | | | | PP | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $43_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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Get_Permanent_Parameter (GET_PP):

With this call, a slave-specific parameter value stored on the EEPROM of the AS-i/ PROFIBUS Gateway is read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $01_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $01_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | PP | | | |

Write Parameter (WRITE_P):

The AS-i slave parameter value transferred with the command is passed on to the addressed AS-i slave.

The parameter is stored on the AS-i/PROFIBUS Gateway only temporarily and is not entered as a configured parameter in the EEPROM!

The AS-i slave transfers its current parameter value in the response (parameter echo). This can deviate from the value that has just been written according to the AS-i master specification. The AS-i slave response is returned as a parameter echo in the response data.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $02_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | – | | | | parameter | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $02_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | slave response | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

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Read Parameter (READ_PI):

This call returns the current parameter value (actual parameter) of an AS-i slave sent by the AS-i/PROFIBUS Gateway.

This value must not be confused with the parameter echo that is supplied by the AS-i slave as a response to the write_parameter job.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $03_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $03_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | PI | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

Store Actual Parameters (STORE_PI):

With this call, the configured parameters stored on the EEPROM are overwritten with the current, permanently stored (actual) parameters; in other words, the parameters of all the AS-i slaves are configured.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $04_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $04_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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Set Permanent Configuration (SET_PCD):

This call sets the following configuration data for the addressed AS-i slave:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are stored permanently on the EEPROM of the AS-i/ PROFIBUS Gateway and are used as the expected configuration by the AS-i master in the protected mode. The configuration data are specified by the manufacturer of the AS-i slave.

If the addressed AS-i slave does not support an extended ID code 1/2, the value $F_{hex}$ must be specified.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $25_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | xID2 | | | | xID1 | | | |
| 5 | ID | | | | I0 | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $25_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

Get Extended Permanent Configuration (GET_PCD):

This call reads the following configuration data (configured data) of an addressed AS-i slave stored on the EEPROM of the AS-i master:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

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The configuration data are specified by the manufacturer of the AS-i slave.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $26_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $26_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | xID2 | | | | xID1 | | | |
| 4 | ID | | | | I0 | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

Store Actual Configuration (STORE_CDI):

With this call, the (actual) configuration data (I/O configuration, ID code, extended ID1 code and extended ID2 code) of all AS-i slaves are stored permanently in the EEPROM as the (expected) configuration data. The list of activated AS-i slaves (LAS) is adopted in the list of permanent AS-i slaves (LPS).

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $07_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $07_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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Read Actual Configuration (READ_CDI):

With this call, the following configuration data of an addressed AS-i slave obtained by the AS-i master on the AS-Interface are read.

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are specified by the manufacturer of the AS-i slave.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $28_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $28_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | xID2 | | | | xID1 | | | |
| 4 | ID | | | | I0 | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

SET_LPS:

With this call, the list of configured AS-i slaves is transferred for permanent storage in the EEPROM of the master.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $29_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | $00_{16}$ | | | | | | | |
| 4 | 7A | &A | 5A | 4A | 3A | 2A | 1A | – |
| … | … | | | | | | | |
| 11 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $29_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

GET_LPS:

With this call, the following entry is read out of the AS-i/PROFIBUS Gateway: The list of projected AS-i slaves (LPS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $44_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $44_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | &A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

GET_LAS:

With this call, the following entry is read out of the AS-i/PROFIBUS Gateway: The list of activated slaves (LAS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $45_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $45_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | &A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

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GET_LDS:

With this call, the following entry is read out of the AS-i/PROFIBUS Gateway: The list of detected AS-i slaves (LDS).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $46_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $46_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | &A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

GET_FLAGS:

With this call, the following entry is read out of the AS-i/PROFIBUS Gateway: The flags according to the AS-i slave specification.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $47_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $47_{16}$ | | | | | | | |
| 2 | T | response | | | | | | |
| 3 | – | | | | | | | Pok |
| 4 | OR | APF | NA | CA | AAv | AAs | S0 | Cok |
| 5 | – | | | | | AAe | OL | DX |

Pok Periphery_Ok
This flag is set when no AS-i slave is signaling a peripheral fault.

S0 LDS.0
This flag is set when an AS-i slave exists with address 0.

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AAs Auto_Address_Assign
This flag is set when the automatic address programming is possible (in other words, AUTO_ADDR_ENABLE = 1 and there is no “incorrect” slave connected to the AS-i Interface).

AAv Auto_Address_Available
This flag is set when the automatic address programming can be executed (in other words, exactly one AS-i slave is currently out of operation).

CA Configuration_Active
The flag is set in the configuration mode and reset in the protected mode.

NA Normal_Operation_Active
This flag is set when the AS-i master is in normal operation.

APF APF
This flag is set when the voltage on the AS-i cable is too low.

OR Offline_Ready
The flag is set when the offline phase is active.

Cok Config_Ok
This flag is set when the desired (configured) and actual configuration match.

AAe Auto_Address_Enable
This flag indicates whether the automatic address programming is enabled (bit = 1) or disabled (bit = 0) by the user.

OL Off-line
This flag is set when the mode is to changed to OFFLINE or this mode has already been adopted.

DX Data_Exchange_Active
If the "Data_Exchnge_Active" flag is set, the the data exchage between AS-i master and slaves is available in the dataexchange phase. If this bit is not set the data exchange is not available. The read ID telgegrams are transmitted to the slave.
The bit is set if the AS-i master entries the offline phase.

SET_OP_MODE:

This call changes the module between the configuration mode and the protected mode.

In the protected mode, only AS-i slaves are activated that are entered in the LPS and whose expected and actual configurations match, in other words, when the I/O configuration and ID codes of the detected AS-i slaves are identical to the configured values.

In the configuration mode, all detected AS-i slaves (except for AS-i slave "0") are activated. This also applies to AS-i slaves in which there are differences between the expected and actual configuration.

The “OPERATION MODE” bit is stored permanently; in other words, it is retained following a cold/warm restart.

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When you change from the configuration mode to the protected mode, there is a warm restart on the AS-i master (change to the offline phase followed by a change to the online mode).

Note

*If an AS-i slave with address "0" is entered in the LDS, the AS-i/PROFIBUS Gateway cannot change from the configuration mode to the protected mode.*

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0C_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | operation mode | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0C_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit operation mode:

0 = protected mode

1 = configuration mode

SET_OFFLINE:

This call switches between the online and offline mode.

The online mode is the normal operating situation for the AS-i master. Here, the following jobs are processed cyclically:

- During the data exchange phase, the fields of the output data are transferred to the slave outputs for all AS-i slaves in the LAS. The addressed AS-i slaves transfer the values of the slave inputs to the master when the transfer was free of errors.
- This is followed by the inclusion phase in which there is a search for the existing AS-i slaves and newly added AS-i slaves are entered in the LDS or LAS.
- In the management phase, jobs from the user such as writing parameters are executed.

In the offline mode, the AS-i/PROFIBUS Gateway only processes jobs from the user. (Jobs that involve the immediate addressing of an AS-i slave are rejected with an error.) There is no cyclic data exchange with the AS-i slaves.

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The OFFLINE = TRUE bit is not permanently stored; in other words, following a cold/ warm restart, the AS-i/PROFIBUS Gateway is once again in the online mode.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0A_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | Off-Line | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0A_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

The master changes to the Offline phase, if there is a 1 written in byte 3.

The master will change to online mode if there is a 0 written in byte 3.

SET_DATA_EX:

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $48_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | Data_Exchange_Active | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $48_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Change Slave Address (SLAVE_ADDR):

With this call, the AS-i address of an AS-i slave can be modified.

This call is mainly used to add a new AS-i slave with the default address "0" to the AS-Interface. In this case, the address is changed from "AS-i slave address old" = 0 to "AS-i slave address new".

This change can only be made when the following conditions are fulfilled:

1. An AS-i slave with “AS-i slave address old” exists.
2. If the old AS-i slave address is not equal to 0, then an AS-i slave with address "0" cannot be connected at the same time.
3. The "AS-i slave address new" must have a valid value.
4. An AS-i slave with "AS-i slave address new" must not exist.

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Note: When the AS-i slave address is changed, the AS-i slave is not reset, in other words, the output data of the AS-i slave are retained until new data are received at the new address.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0D_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | source address | | | | |
| 4 | – | | B | target address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0D_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

Set Auto Address Enable (SET_AAE):

This call can enable or disable the "automatic address programming" function

The AUTO_ADDR_ENABLE bit is stored permanently; in other words, it is retained after a warm/hot restart on the AS-i master.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0B_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | Auto_Address_Enable | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $0B_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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EXEC_CMD:

With this call the master gets a message from the host that a message should be transmitted to the AS-i slaves.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $49_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | B | slave address | | | | |
| 4 | – | | | info5 | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $49_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | info4 | | | | |

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

GET_LPF:

With this call, the list of peripheral faults (LPF) signaled by the AS-i slaves is read out from the AS-i master. The LPF is updated cyclically by the AS-i master. Whether an when an AS-i slave signals faults of the attached peripherals (for example wire break) can be found in the description of the AS-i slave.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3E_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3E_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | &A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

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Write AS-i Slave Extended ID1 (WRITE_XID1):

With this call, the extended ID1 code of an AS-i slave with address "0" can be written directly over the AS-i cable. The call is intended for diagnostic purposes and is not required in the normal master mode.

The AS-i master passes on the extended ID1 code to the AS-i slave without any plausibility check.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3F_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | | | xID1 | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $3F_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

RD_7X_IN:

With this command the four 16 bit channels of an AS-i input slave according to the slave profil 7.3 can be read.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $50_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | slave address | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $50_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 10 | channel 4, low byte | | | | | | | |

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WR_7X_OUT:

With this command the four 16 bit channels of an AS-i output slave according to the slave profil 7.3 can be written.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $51_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | slave address | | | | |
| 4 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 11 | channel 4, low byte | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $51_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

RD_7X_OUT:

With this command the four 16 bit channels of an AS-i output slave according to the slave profil 7.3 can be read out of the AS-i/PROFIBUS Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $52_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $52_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 10 | channel 4, low byte | | | | | | | |

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RD_7X_IN_X:

With this command the four 16 bit channels of 4 AS-i input slaves with succesive addresses according to the slave profil 7.3 can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $53_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $53_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 1st slave, channell 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 34 | 4th slave, channel 4, low byte | | | | | | | |

WR_7X_OUT_X:

With this command the four 16 bit channels of 4 AS-i output slaves with succesive addresses according to the slave profil 7.3 can be written.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $54_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |
| 4 | 1st slave, channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 35 | 4th slave, channel 4, low byte | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $54_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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RD_7X_OUT_X:

With this command the four 16 bit channels of 4 AS-i output slaves with succesive addresses according to the slave profil 7.3 can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $55_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | – | | 0 | 1st slave address | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $55_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 1st slave, channel 1, high byte | | | | | | | |
| … | … | | | | | | | |
| 34 | 4th slave, channel 4, low byte | | | | | | | |

READ_ODI:

With this call the output data values of all AS-i slaves is read out of the AS-i/ PROFIBUS Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $56_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $56_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | – | | | | slave 1A | | | |
| | slave 2A | | | | slave 3A | | | |
| … | … | | | | | | | |
| 34 | slave 30B | | | | slave 31B | | | |

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Get_LPS, Get_LAS, Get_LDS, Get_Flags (GET_LISTS):

With this call, the following entries are read out of the AS-i/PROFIBUS Gateway:

- The list of active AS-i slaves (LAS)
- The list of detected AS-i slaves (LDS)
- The list of projected AS-i slaves (LPS)
- The flags according to the AS-i slave specification

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $30_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $30_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LAS | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |
| 11 | 7A | 6As | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LDS | | | | | | | |
| 19 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |
| 20 | 7A | 6As | 5A | 4A | 3A | 2A | 1A | 0A |
| … | LPS | | | | | | | |
| 26 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |
| 27 | – | | | | | | | Pok |
| 28 | OR | APF | NA | CA | AAv | AAs | S0 | Cok |
| 29 | – | | | | | AAe | OL | DX |

Pok Periphery_Ok
S0 LDS.0
AAs Auto_Address_Assign
AAv Auto_Address_Available
CA Configuration_Active
NA Normal_Operation_Active
APF APF
OR Offline_Ready
Cok Config_Ok
AAe Auto_Address_Enable
OL Off-line
DX Data_Exchange_Active

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GET_LCS:

With this call, the List of Corrupted Slaves (*LCS*) is read out of the AS-i/PROFIBUS Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $60_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $60_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

GET_LOS:

With this call, the List of Offline Slaves (*LOS*) is read out of the AS-i/PROFIBUS Gateway (see chapter 6).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $61_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $61_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

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SET_LOS:

With this call, the List of Offline Slaves is written to the AS-i/PROFIBUS Gateway (see chapter 6).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $62_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | 7A | 6A | 5A | 4A | 3A | 2A | 1A | 0A |
| … | … | | | | | | | |
| 10 | 31B | 30B | 29B | 28B | 27B | 26B | 25B | 24B |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $62_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

GET_TECA:

With this call the error counters of all single slaves / A-slaves can be read (see chapter 6).

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $63_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $63_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | APF | | | | | | | |
| 4 | slave 1A | | | | | | | |
| … | … | | | | | | | |
| 34 | slave 31A | | | | | | | |

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GET_TECB:

With this call the counts of the error counters for B-slaves are read out (see chapter 6).

With every read out of the counts the error counters are restarted.

The counts are read out via the correspondending host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $64_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $64_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | APF | | | | | | | |
| 4 | slave 1B | | | | | | | |
| … | … | | | | | | | |
| 34 | slave 31B | | | | | | | |

GET_TEC_X:

With this call beginning by a definite slave address the counts of the n error counters are read out (see chapter 6).

With every read out of the counts the error counters are restarted.

The counts are read out via the correspondending host interface and will be deleted with every read access. The counter value is limited to 254. 255 means counter overflow.

| **Anfrage** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $66_{16}$ | | | | | | | |
| 2 | T | Kreis | | | | | | |
| 3 | 1. Slave-Adresse | | | | | | | |
| 4 | Anzahl der Zähler | | | | | | | |

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| Antwort | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $66_{16}$ | | | | | | | |
| 2 | T | Ergebnis | | | | | | |
| 3 | Zähler 1 | | | | | | | |
| … | … | | | | | | | |
| n | Zähler n - 2 | | | | | | | |

EXT_DIAG:

With this call, the conditions when to set the ExtDiag bit can be selected.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $71_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | CF | | | | | | | |
| 4 | APF | | | | | | | |
| 5 | PF | | | | | | | |
| 6 | CS | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $71_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

CF ExtDiag is set, if ConfigError ≡ 1
APF ExtDiag is set, if APF ≡ 1
PF ExtDiag is set, if PeripheryFault ≡ 1
CS ExtDiag is set, if LCS is not empty

OPTIONS:

With this call, the options string is read out of the AS-i/PROFIBUS Gateway.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $74_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

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| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $74_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | character 1 | | | | | | | |
| … | … | | | | | | | |
| 18 | character 16 | | | | | | | |

BUTTONS:

With this call, the use of the buttons can be enabled/disabled.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $75_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | ButtonsDisabled | | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $75_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

RD_EXT_DIAG:

With this call, the conditions when the ExtDiag bit is set can be read.

| Request | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7B_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |

| Response | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $75_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |
| 3 | CF | | | | | | | |
| 4 | APF | | | | | | | |
| 5 | PF | | | | | | | |
| 6 | CS | | | | | | | |
| 7 | FD | | | | | | | |

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CF ExtDiag is set by ConfigError ≡ 1
APF ExtDiag is set by APF ≡ 1
PF ExtDiag is set by PeripheryFault ≡ 1
CS ExtDiag is set, if LCS is not empty
FD Diagnosis will updated still only then, if this is dictated by the norm of PROFIBUS. Diagnosis data are doubtful not actual

INVERTER:

With that call an AS-i slave for frequency inverters is switched to the mode to get four 16 bit values via the AS-i analog profile 7.3 and afterwards switched to the selcted destination parameter.

| **Request** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7C_{16}$ | | | | | | | |
| 2 | T | circuit | | | | | | |
| 3 | slave address | | | | | | | |
| 4 | destination parameter | | | | | | | |
| 5 | value 1, high byte | | | | | | | |
| 6 | value 1, low byte | | | | | | | |
| 7 | value 2, high byte | | | | | | | |
| 8 | value 2, low byte | | | | | | | |
| 9 | value 3, high byte | | | | | | | |
| 10 | value 3, low byte | | | | | | | |
| 11 | value 4, high byte | | | | | | | |
| 12 | value 4, low byte | | | | | | | |

| **Response** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| byte | $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
| 1 | $7C_{16}$ | | | | | | | |
| 2 | T | result | | | | | | |

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### 7.3.3 Mailbox example

Command RD_7X_IN: Reading of analog input values

**PROFIBUS-DP V0: cyclic data exchange**

Used ID/module in the GSD file: 12 bytes management

Meaning of the bytes:

| Request: RD_7X_IN | |
|---|---|
| Byte 1 | $50_{hex}$ (RD_7X_IN) |
| Byte 2 | $00_{hex}$ (master 1, single master) |
| Byte 3 | $1D_{hex}$ (slave address 29) |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

| Response | |
|---|---|
| Byte 1 | $00_{hex}$ |
| Byte 2 | $00_{hex}$ |
| Byte 3 | $00_{hex}$ |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

The mailbox call has not been anwsered with the valid values, beause the toggle bit has not been set.

Set of Toggle bit:

| Request | |
|---|---|
| Byte 1 | $50_{hex}$ |
| Byte 2 | $80_{hex}$ (Toggle bit, master 1, single master) |
| Byte 3 | $1D_{hex}$ (slave address 29) |
| Byte 4 | $00_{hex}$ |
| … | … |
| Byte 12 | $00_{hex}$ |

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| Response | |
|---|---|
| Byte 1 | $50_{hex}$ |
| Byte 2 | $80_{hex}$ (Toggle bit, master1) |
| Byte 3 | analog channel 1 high $byte_{hex}$ |
| Byte 4 | analog channel 1 low $byte_{hex}$ |
| Byte 5 | analog channel 2 high $byte_{hex}$ |
| Byte 6 | analog channel 2 low $byte_{hex}$ |
| Byte 7 | analog channel 3 high $byte_{hex}$ |
| Byte 8 | analog channel 3 low $byte_{hex}$ |
| Byte 9 | analog channel 4 high $byte_{hex}$ |
| Byte 10 | analog channel 4 low $byte_{hex}$ |
| Byte 11 | $00_{hex}$ not usedt |
| Byte 12 | $00_{hex}$ not usedt |

To get the input data again, the T-bit has to be reset aso.

If a mailbox command is used via PROFIBUS-DP V1, it is not necessary to use the toggle bit.

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# 8 Commissioning Tools and Accessories

The AS-i circuit on the AS-i/PROFIBUS Gateway can be put into operation with the comfortable Windows software "AS-i Control" Tools (ASI-CT210).

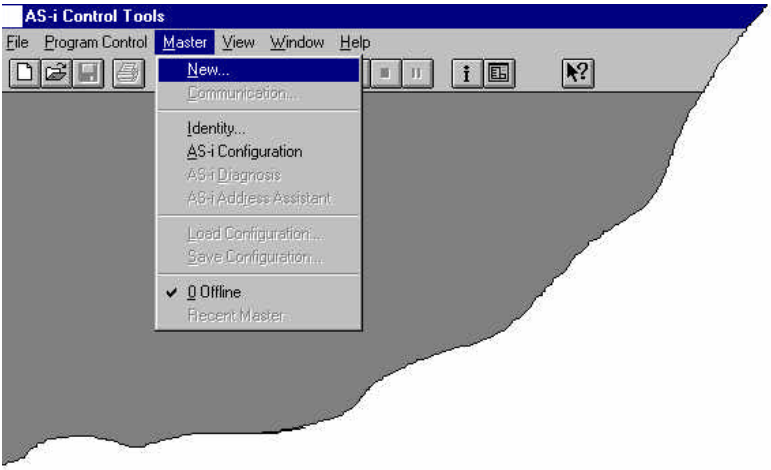
This software communicates with the AS-i/PROFIBUS gateway by means of a PROFIBUS converter, which converts the RS 232-signals of the PC to PROFIBUS.

This software communicates with the AS-i/PROFIBUS gateway by means of a PROFIBUS DP Mastersimulator DP V0/DP V1 (PR-MSV0/PR-MVSV1), which converts the RS 232-signals of the PC to PROFIBUS.

The AS-i master in IP65 needs an additional D-Sub data transmission cord for the AS-i masters in IP65 (DOL-RS485-02M).

## 8.1 Windows Software AS-i Control Tools

1. For that purpose plug in a Bihl+Wiedemann PROFIBUS-DP Master Simulator DP V1 to the D-SUB-connector of the AS-i/PROFIBUS gateway and connect the device with a fully covered cable to the serial interface of your PC.
2. Start the AS-i Control Tools.
3. Call the command Master | New.




4. Choose PROFIBUS as protocol.

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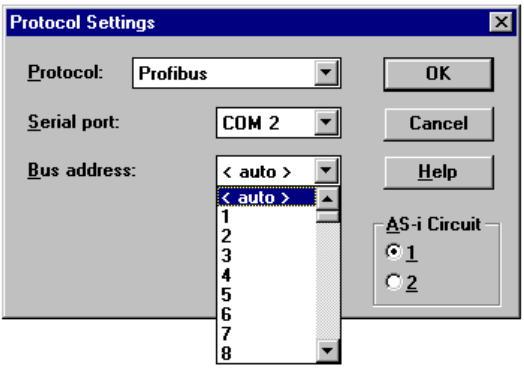
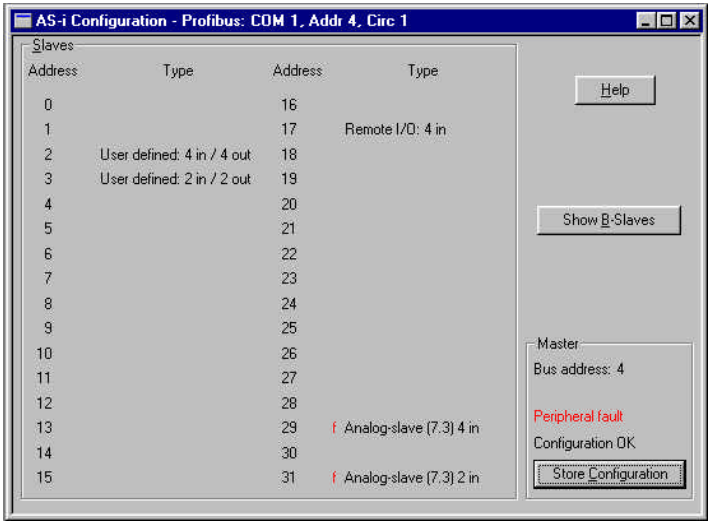
5. Do the appropriate settings. (e.g. serial interface COM 2, station address <auto>, AS-i circuit 1)




6. Call the command Master | AS-i configuration.
   The AS-i configuration editor will be started. All detected and projected AS-i slaves are displayed in this window.

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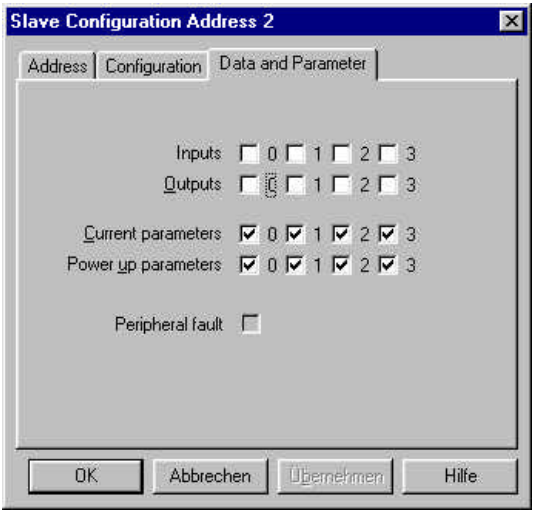
7. Click on a slave entry to open the dialogbox slave configuration.




This dialog box is for changing a slave address, setting AS-i parameters or AS-i configuration data. Additionally you can test inputs and outputs.

A very easy approach to configure the AS-i circuit is connecting each AS-i slave to the line and setting the AS-i slave address one after the other. After that press the button “Store configuration” to adopt the detected AS-i circuit to the AS-i master as projected data.

Moreover you can use the **AS-i Address Assistant**. This tool changes automatically the address of an AS-i slave to the desired address after plugging the slave to the AS-i line. The desired AS-i configuration can be created off-line before and stored to a file. When you build up the plant you only have to plug the AS-i slaves to the AS-i line one after the other.

Further descriptions to all features of the software can be obtained from the integrated help.

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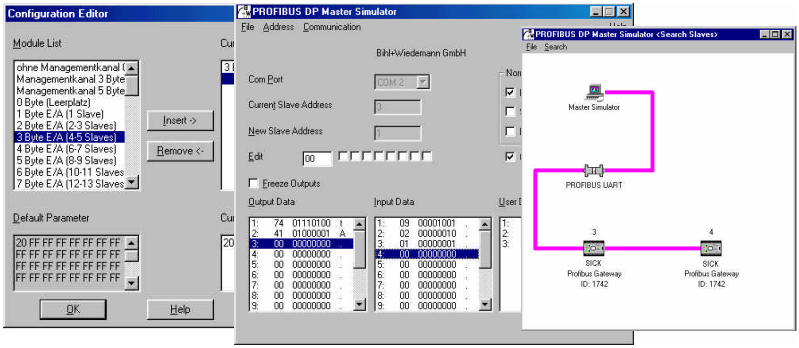
## 8.2 PROFIBUS-DP Master Simulator




The PROFIBUS-DP Master Simulator PR-MSV0 is an easy to use software for data exchange with PROFIBUS slaves of many suppliers via PROFIBUS-DP. The PROFIBUS-DP Master Simulator can exchange data with many PROFIBUS slaves even without GSD-file or type-file. The PROFIBUS slaves can be put into operation with the default I/O window. Input data can be read and output data can be written. Furthermore the PROFIBUS-DP Master Simulator also processes GSD-files. User parameters can be edited and the configuration can be modified and stored. The PROFIBUS station address can be changed as well with the PROFIBUS-DP Master Simulator, this is useful for PROFIBUS I/O modules in protection class IP67 without addressing switches.

The PROFIBUS-DP Master Simulator offers the possibility to scan a PROFIBUS network for connected slaves and display them in a graphical way. In this case the PROFIBUS UART has to be connected directly to a PROFIBUS slave. The I/O data and the PROFIBUS user diagnosis can be displayed binary, hexdecimal and now also as ASCII code. The PROFIBUS output data can be transmitted consistently to the PROFIBUS slave. In **type mode** it is possible to set an output as long as the mouse button is pressed.

The new version of the PROFIBUS-DP Master Simulator (PR-MSV1) supports PROFIBUS-DP V1. PROFIBUS slaves can be operated in the acyclic mode DP V1. This is helpful especially for the commissioning of complex field devices like drives, modular I/O systems etc.

The PROFIBUS Master Simulator consists of the software and the **PROFIBUS UART** which is the ideal interface converter between the RS 232 interface of a PC and the PROFIBUS slave. The **UART** does not need any additional external power supply. Therefore it is also suitable for mobile use with a laptop or a notebook. The **PROFIBUS UART** is simply inserted between the PROFIBUS slave and RS 232 connector cable.

Beside the software "PROFIBUS DP Mastersimulator" now **DLL drivers** for Windows 3.1x, Windows 95/98, Windows NT as well as examples written in C come with the PROFIBUS UART. This offers the possibility to **use the PROFIBUS UART in an application in combination with an own software**. However the PROFIBUS UART is a monitoring and commissioning tool for PROFIBUS slaves, it is not designed to control automation processes.

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# 9 Appendix: Displays of the Figure Display

In the basic state of the configuration mode, the display shows one after the other the addresses of all detected slaves at a rate of two per second. A blank display means that the *LDS* is empty, i.e. no slaves were detected.

In the basic state of the protected operating mode, the display is either blank or displays the address of a faulty assignment (see chapter 5.4.2).

During manual address programming, the slave address display has a different meaning (see chapter 5.5 and 5.6).

All displayed numbers that are bigger than 31 and therefore can not be interpreted as a slave address are status or error messages of the master. They have the following meanings:

| | |
|---|---|
| 39 | Advanced AS-i diagnostics: If a 39 appears on the display after pressing the 'set'-button a short-time AS-i power failure occured. |
| 40 | The AS-i master is in off-line phase. |
| 41 | The AS-i master is in detection phase. |
| 42 | The AS-i master is in activation phase. |
| 43 | The AS-i master starts the normal operating mode. |
| 70 | Hardware error: The AS-i master's EEPROM cannot be written to. |
| 72 | Hardware error: The PIC processor does not respond. |
| 73 | Hardware error: The PIC processor does not respond. |
| 74 | Checksum error in the EEPROM. |
| 75 | Error in the external RAM. |
| 76 | Error in the external RAM. |
| 77 | AS-i control software error: Stack overflow (AS-i control II) |
| 78 | AS-i control software error: Checksum error in the control program. |
| 80 | Error while attempting to exit the configuration mode: A slave with address zero exists. |
| 81 | General error while changing a slave address. |
| 82 | The front panel operation is blocked. Until the next power-up of the AS-i master the accessing to the device only from the host via the interface. |
| 83 | Program reset of the AS-i Control programm: The AS-i Control programm is just read out of EEPROM and copied into the RAM. |
| 88 | Display test while starting up the AS-i master |
| 90 | Error while changing a slave address in protected operating mode: No slave with address 0 existing. |
| 91 | Error while changing slave address: Target address is already occupied. |
| 92 | Error while changing slave address: New address could not be set. |
| 93 | Error while changing slave address: New address could only be stored volatile in the slave. |
| 94 | Error while changing slave address in protected operating mode: Slave has wrong configuration data. |

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| | |
|---|---|
| 95 | Error while changing slave address in protected operating mode: The configuration error was caused by one slave too many (instead of one missing slave). |

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# 10 Appendix: The First Commissioning of AS-i

Note

*In this chapter an example is given of how to put an AS-i network into operation quickly and easily and without the need for external devices. The addressing of the components connected to the AS-i network can be performed directly on the AS-i master. It is of course more comfortable to do the addressing with a hand-held programming device or with the . However, it is possible to configure even complex networks using only the AS-i master.*

| **What to do ?** | **How to go about it?** |
|---|---|
| See to it that the AS-i master is properly supplied with power. | Using AS-i master with power supply “A”: Connect the AS-i power supply unit to the terminals AS-i + and AS-i - of the master, connect the ground terminal. Turn on the power supply. |
| After the self-test: the LEDs “power”, “config err”,”U ASI” and “prj mode” are on. The figure display shows “40”: the AS-i master is in the off-line phase. Shortly after that a “41” will be displayed: the AS-i master stays in the detection phase. | |
| Switch the device to the projecting mode, if the yellow LED does not light up. | Press the “modeMODE”-button for approx. five seconds. |
| The yellow LED “prj mode” lights up. The device is now in projecting mode. | |
| Add a slave with the address 0 to the AS-i line. | Connect the slave's terminals with the terminals AS-i +/- of the master. |
| The green LED “ASI active” lights up. The figure display shows “0”. This means the AS-i master has detected the slave. | |
| Change the slave address to address 1. | Select address 1 by pressing the “set” button shortly, if necessary repeatedly. When a “1” appears on the display press the “set” button for approx. five seconds until the display blinks. Press again shortly the “set” button to assign the new address to the slave. |
| The AS-i master detects the slave with address 1 and displays “1”. | |
| Connect another slave with address 0 to the AS-i line and allocate the address 2 to it. | Connect the slave to the AS-i line. The addressing is the same as for the previous slave. |
| The addresses of all slaves detected are now displayed sequentially. | |
| Change to the protected operating mode and store the AS-i configuration. | Leave the configuration mode by pressing the “mode” button for at least five seconds until the “prj mode” LED goes out. |

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| What to do ? | How to go about it? |
|---|---|
| The configuration of the AS-i master is now finished.<br>Now the hierarchically higher fieldbus system can be put into operation.<br>**The gateway stays in the off-line phase (Display dark, the LED ASI active is out), until the hierarchically higher fieldbus system operates properly.** | |

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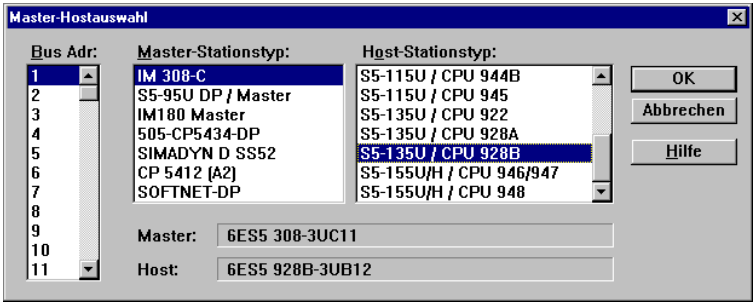
# 11 Appendix: Putting PROFIBUS into Operation with a Siemens S5

This chapter shows exemplarily the putting into operation of an AS-i/PROFIBUS gateway (ASI-M31320, ASI-M31330) on PROFIBUS for the PLC Simatic S5 135 of Siemens with the PROFIBUS master card IM 308 C. The configuration software used is the Siemens COM PROFIBUS 3.0 (German version).

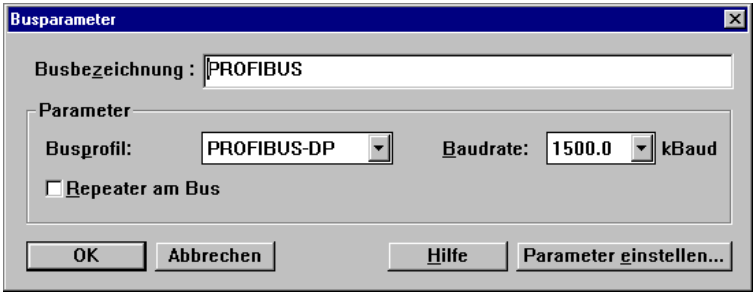
## 11.1 Putting into Operation in Easy Mode

1. Copy the GSD-file "B_W_1745.GSD" from the diskette “AS-i/PROFIBUS Gateway IBM PC Software” from the directory A:\GSD to the directory \GSD of the software COM PROFIBUS 3.0.
2. Start the configuration software COM PROFIBUS 3.0
3. Execute the command “File | Scan GSD-Files”.
4. Execute the command “File | New”.
   The dialog box “Master & Host Selection” appears.




   Select your PROFIBUS master.

5. With the command “Configure | Master Parameters...” you can select the baudrate and other bus parameters.

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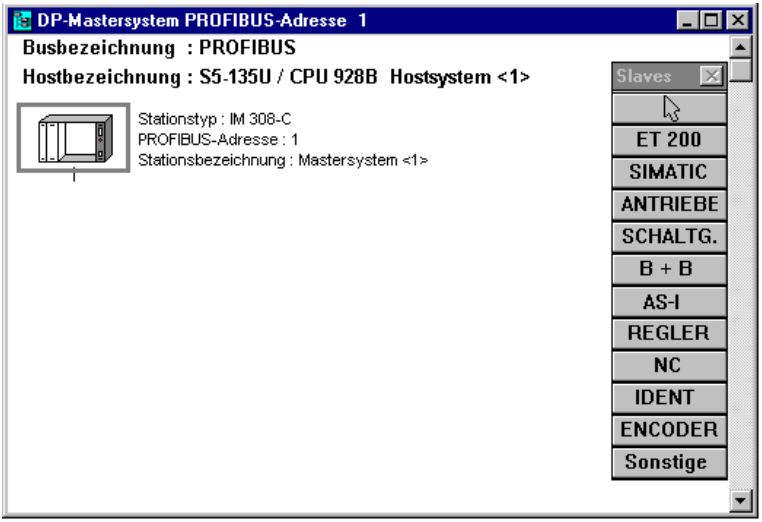
6. In the window “DP Master System” there is a ledge with several PROFIBUS slaves. Click on AS-i and drag the icon to the PROFIBUS in the window above.




7. After a second mouse click the dialogbox for the selection of the PROFIBUS station address appears. Setting of the AS-i/PROFIBUS gateway's station address see chapter 5.7:

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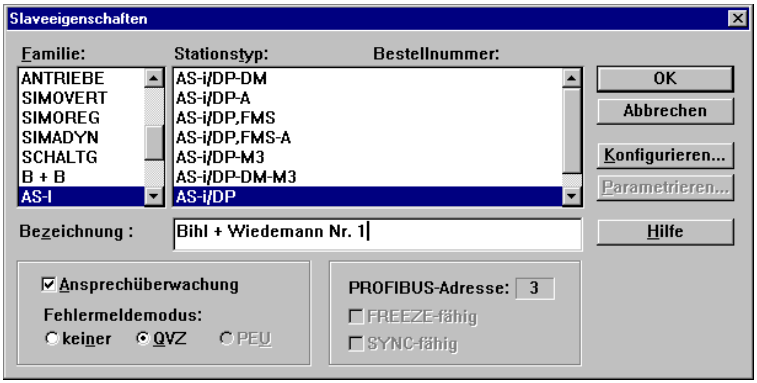
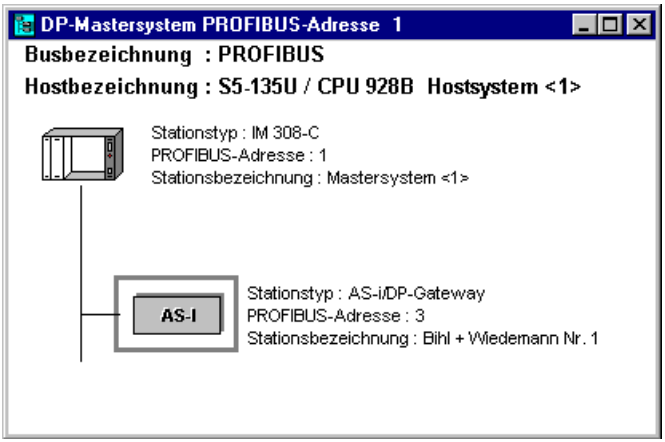
8. and afterwards the dialogbox for the selection of the device type (Slave Parameters):




Choose “AS-i/DP” as station type. This name stands for the GSD-file with the settings for the easy mode.

9. Afterwards, your PROFIBUS system looks as follows:

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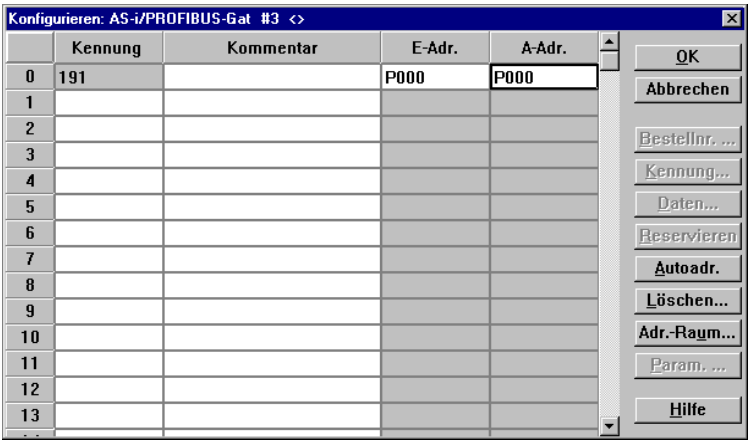
10. Select the PROFIBUS slave. With the command “Configure | Slave Parameters... | Configure...” you get to the dialogbox “Configure”.




| | Kennung | Kommentar | E-Adr. | A-Adr. |
|---|---|---|---|---|
| 0 | 191 | | P000 | P000 |
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |

OK
Abbrechen
Bestellnr. ...
Kennung...
Daten...
Reservieren
Autoadr.
Löschen...
Adr.-Raum...
Param. ...
Hilfe

The fields “I Addr.” and “O Addr.” hold the start addresses for the AS-i data. The easiest way to set the addresses is with “Auto Addr.“. From these addresses 16 bytes of AS-i data each are mapped to the address space of your PLC.
This AS-i data can be processed with your user program by means of load and transfer operations.

11. After closing this dialogbox save your project with the command “File | Save”.

12. The last step is exporting the data to a memory card with the command “File | Export | Memory Card...”

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